Apple II

TECHNICAL BULLETIN

June–July 1990 Issue 10

FEATURE ARTICLES

TECH SHEETS

DEPARTMENTS

Annual Subscription: $129

Overview: MPW IIGS

The Apple® MPW® IIGS® Cross-Development Suite is a set of interfaces, libraries, and tools that work in conjunction with the Macintosh® Programmer's Workshop (MPW) shell. With MPW IIGS, developers can use the basic functionality of MPW to develop software for the Apple IIGS® personal computer and other members of the Apple II family. The cross-development suite is ideal for programmers who want the advantages of both MPW and the Macintosh computer when developing Apple IIGS applications, and for developers who target applications at both the Macintosh and Apple IIGS markets.

Languages in the MPW IIGS family available from Apple include a powerful macro assembler, a C compiler, and a Pascal compiler. A single application can be developed in more than one language. Finished applications run on the Apple IIGS, and utilities are included that support the creation of programs for the other members of the Apple II family.

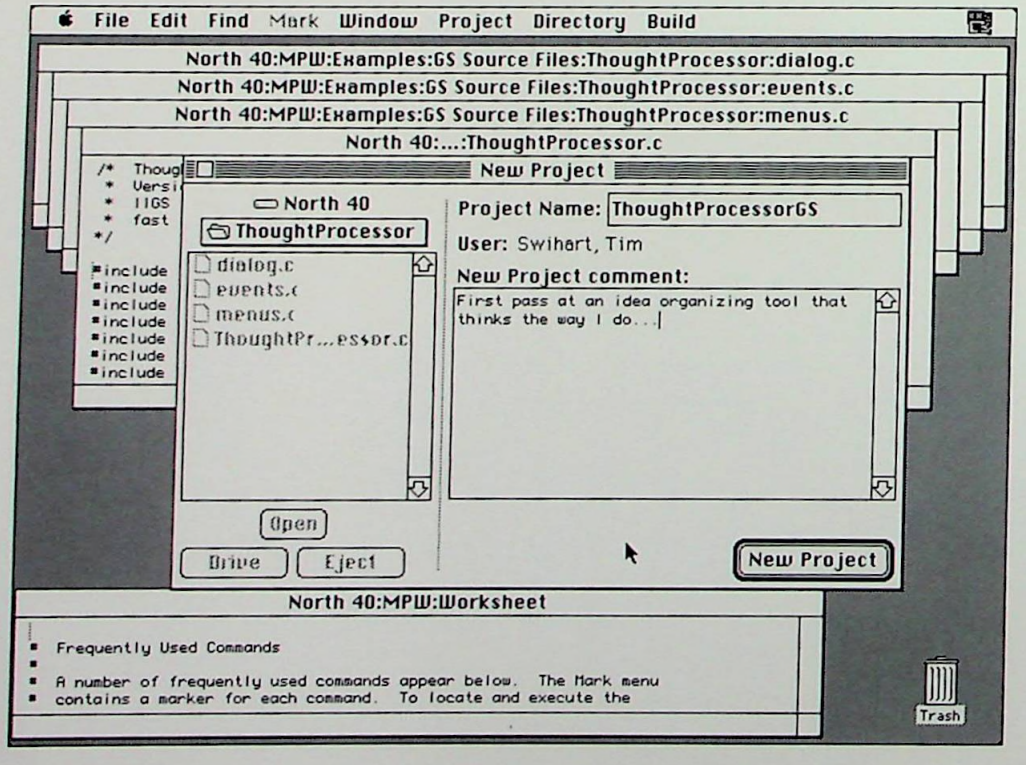
Components of the MPW IIGS Cross-Development Suite include the following:

- **MPW IIGS Tools.** The Tools component is essential to accessing the features of Apple IIGS System Software Version 5.0 and greater. The MPW IIGS Tools include these:

  —**LinkIIGS** allows you to link files created by the MPW IIGS Assembler, MPW IIGS Pascal compiler, and MPW IIGS C. You can accomplish complete control of segmentation—without recompiling—with this linker, or you can use automatic segmentation instead. By default, programs linked with this tool take full advantage of the IIGS ExpressLoader for maximum run-time performance.

  —**DumpObjIIGS** displays object or load files in any of several formats, and includes the option of disassembling the file's contents.

  —**DuplicateIIGS** converts MPW IIGS files into ProDOS® files and vice versa. You can copy resource forks in either direction, and you can translate complete folders and directories.



—**RezIIGS** compiles resources into a format compatible with the IIGS Resource Manager. The RezIIGS language is nearly identical to that used by the MPW Rez tool.

—**DeRezIIGS** disassembles Apple IIGS resource forks. A port of MPW DeRez, it features the same command structure, feature set, and capabilities.

- **MPW IIGS Assembler.** This full-featured macro assembler supports all the instructions and addressing modes of the 65816, 6502, 65C02, and NCrCX02 processors and the Mitsubishi 740 microcontroller. Object modules created with the MPW IIGS Assembler can be linked with MPW IIGS C or Pascal object modules.

  Based on the MPW Assembler and using a similar syntax, the MPW IIGS Assembler includes a one-way translation utility to help convert APW™ (Apple IIGS Programming Workshop) source code. (The conversion process is not fully automatic and requires some editing.) A conversion utility is also included that translates EdAsm source into MPW IIGS Assembly source.

  The MPW IIGS Assembler provides a range of utility macros to aid in programming, as well as a full set of tool interface macros and equates for the Apple IIGS Toolbox.

- **MPW IIGS C.** The MPW IIGS C compiler generates code for the 65816 microprocessor. A full Kernighan and Ritchie implementation of the C language, it includes extensions for void and enumerated types, and structure-passing. The compiler supports source-level segmentation of load files, and the package includes standard C input/output library and Apple IIGS tool interfaces. The code is source compatible with APW C, with only minor exceptions.

- **MPW IIGS Pascal.** This compiler is based on, and uses syntax almost identical to, MPW Pascal Version 3.0. MPW IIGS provides nearly all the Pascal capabilities described in the ANSI Pascal Standard, and supports the Standard Apple Numerics Environment (SANE®). It supports type coercion techniques, bit manipulation routines, and other extensions. An INLINE extension allows you to specify machine instructions and access global data and functions. MPW IIGS Pascal also includes a library of standard Pascal I/O routines. Unlike MPW Pascal, MPW IIGS Pascal does not support object-oriented programming.

- **Interface Libraries.** MPW IIGS and its associated languages include libraries and interfaces that provide complete access from assembly, C, and Pascal to all Apple IIGS Toolbox and system software calls, including those in the GS/OS® operating system.

The MPW IIGS suite provides the following benefits:

- The integrated development environment of MPW IIGS lets you switch between a compiler, a linker, an editor, and other tools without leaving the main environment.

- You can transfer files to the Apple IIGS via an AppleShare® file server. Compatibility with the AppleShare file server also allows multiple access to Projector®—an included utility program for managing software projects—for smooth project coordination.

- Support for multilanguage applications allows you to take advantage of existing routines in other languages, or to combine the work of programmers who use different languages. Assembly, C, and Pascal object modules can all be used together.

- A comprehensive help system displays information about a requested topic through a simple command; it then leads you to the tools you need. The help system also includes Commando, a graphical front end for MPW IIGS tools and commands.

- Sample programs are included with each language to provide an appropriate example for both an Apple IIGS application and a desk accessory. Other sample programs are available separately on the Apple IIGS Source Code Sampler, available through APDA™ (Apple Programmers and Developers Association) and consisting of two 3.5-inch Apple II disks and one Macintosh disk.

System Requirements

To use the MPW IIGS Cross-Development Suite, you'll need the following:

- An Apple Macintosh Plus, Macintosh SE, or Macintosh II personal computer with a hard disk drive and at least 2 megabytes of RAM and 128K of ROM (68020 or 68030 microprocessor recommended)

- Macintosh System Software Version 6.0.2 or greater

- MPW Version 2.0.2 or greater (Only the development environment is required.)

- An Apple IIGS with enough memory to run the developed program.

Availability

The MPW IIGS Cross-Development Suite is available from APDA in the following separate products:

- MPW IIGS Assembler Version 1.0 includes two disks containing the Macintosh Programmer's Workshop IIGS Assembler, Assembler interfaces to the IIGS Toolbox, and sample programs. It also includes the *Macintosh Programmer's Workshop 1.1 IIGS Assembler Reference* manual.

- MPW IIGS C Version 1.0.1 includes two disks containing the Macintosh Programmer's Workshop IIGS C compiler, C interfaces to the IIGS Toolbox, and sample programs. It also includes the *Macintosh Programmer's Workshop 1.1 IIGS C Reference* manual.

- MPW IIGS Pascal Version 1.0B1 includes two disks containing the Macintosh Programmer's Workshop IIGS Pascal compiler, Pascal interfaces to the IIGS Toolbox, and sample programs. It also includes the *Macintosh Programmer's Workshop 1.1 IIGS Pascal Reference* manual.

- MPW IIGS Tools Version 1.1 includes one disk containing the Macintosh Programmer's Workshop IIGS Tools. It also includes the *Macintosh Programmer's Workshop 1.1 IIGS Tools Reference* manual.

For ordering information, contact APDA as follows:

APDA
Apple Computer, Inc.
20525 Mariani Avenue, M/S 33G
Cupertino, CA 95014
TLX: 171-576
1-800-282-APDA
AppleLink®: APDA
CompuServe: 766,2045
MCI Mail: POSTROM
Fax: (408) 562-3971
GEnie: A.Developer3

Apple Developer Tools Express: New Development Resource

In April, Apple introduced Developer Tools Express℠, a new program that expands Apple's distribution of developer tools and information. The service provides a convenient source of tools, languages, and technical documentation essential for creating software and hardware for Apple II and Macintosh computers. Developer Tools Express allows you to order final-release (fully tested and documented) Apple and selected third-party development products from Apple without the annual subscription fee or customer agreement required by the Apple Programmers and Developers Association (APDA).

Developer Tools Express is an addition to Apple's programs for developers. APDA continues to be the most comprehensive source of development tools. Providing a choice of programs makes it easier for development customers—commercial developers, in-house programmers, and enthusiasts—to obtain the products and technical documentation they need.

Developer Tools Express

Developer Tools Express is a new mail-order distribution channel that allows anyone to purchase fully tested and documented versions of key development tools, technical references, and third-party products distributed by Apple. There is no annual fee or subscription requirement to order through Developer Tools Express. You can place orders via a toll-free phone number and charge your order directly to a major credit card. A product and price list is available upon request.

APDA

APDA remains Apple's comprehensive subscription program for customers with extensive development needs. More than 25,000 APDA members have access to the widest variety of development products, including prerelease (beta) versions of products and specialized, hard-to-find development tools. In addition, members receive the quarterly journal *APDAlog*™, which includes product descriptions and topical development information written by Apple and industry experts. The APDA program is intended for developers who need access to preliminary releases of Apple development tools in order to help maintain their competitive edge in the marketplace.

All Apple computer users worldwide are eligible to participate in Developer Tools Express or APDA. The two resources provide convenient access to hundreds of Apple and third-party development tools and a large library of technical documentation, including the Apple Technical Library, published by Addison-Wesley. An extensive selection of third-party development tools complement Apple's product line.

For additional information about Developer Tools Express or APDA, contact:

Apple Developer Channels
Apple Computer, Inc.
20525 Mariani Avenue, M/S 33G
Cupertino, CA 95014-6299

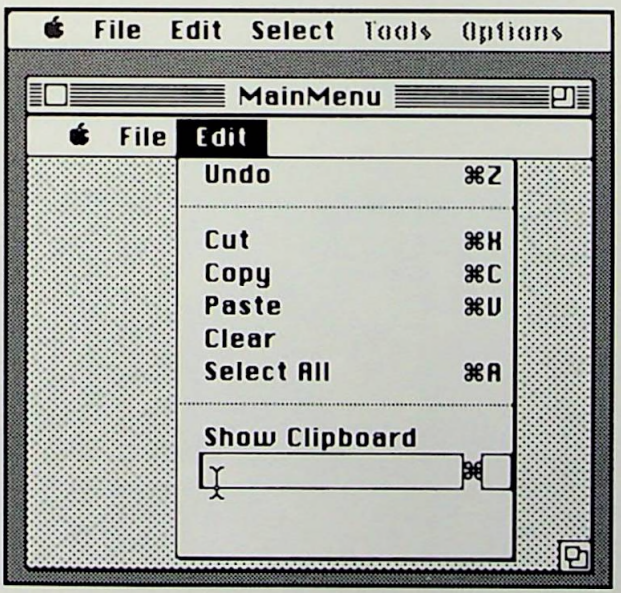
United States: 1-800-282-2732
Canada: 1-800-637-0029
International: (408) 562-3910

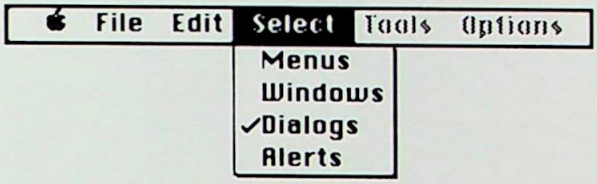
AppMaker/GS

AppMaker/GS, an application generator from Bowers Development, is a programmer's tool that cuts development time for Apple IIGS applications by automatically generating source code for standard elements of the user interface, such as menus, windows, scroll bars, and buttons. Using the Macintosh as a development platform, the user points and clicks to arrange elements of the user interface on the screen. AppMaker then generates source code in Pascal, C, or assembly language for Apple's MPW IIGS Cross-Development Suite (see "Overview: MPW IIGS," page 2).

You can use AppMaker/GS to enhance existing applications or to create new applications. Its resource editor allows you to modify or delete existing resources or to add new ones. AppMaker can generate source files for specific dialogs or menus or for the entire application.

AppMaker/GS provides the tools for creating user interfaces and creates the complete source code to





drive the interface. The entire shell of the application is coded by AppMaker/GS—including starting the tools, the event loop, parsing menu items, support for desk accessories, a simple About box, scrolling/zooming/resizing windows, and opening and closing windows. In a matter of minutes, a programmer can lay out a simple IIGS application interface, compile and link the source code created by AppMaker/GS, and run the application on an Apple IIGS computer.

It's also possible to use AppMaker/GS in conjunction with AppMaker for the Macintosh to develop an application for both the Macintosh and the Apple IIGS computers simultaneously. The code generated by AppMaker/GS is equivalent in function to that generated by AppMaker for the Macintosh, but is organized differently—the IIGS TaskMaster greatly simplifies the code. The AppMaker/GS support library of commonly used routines is also equivalent to that supplied with the Macintosh version, but is likewise greatly simplified by the TaskMaster Toolbox call. TaskMaster is part of the Apple IIGS (using System Disk 5.0 and later). TaskMaker handles many generic events, such as zooming windows and launching desk accessories. It even handles controls in windows, making complex user interfaces easy to implement.

You can easily port Macintosh applications to the Apple IIGS. AppMaker/GS allows you to convert Macintosh resources to the equivalent IIGS resources, and then generates source code to run the newly converted resources on the IIGS.

AppMaker/GS allows programmers to experiment with a variety of alternative user interfaces on the computer—rather than on paper—without having to write any code. Experienced programmers can create a user interface for an enhancement to an existing application or for an entire new application. Beginning programmers can create a working application and gradually finish it as they learn more about programming—or they can study the AppMaker/GS-generated application to learn to program. Because AppMaker doesn't require that the user learn a whole set of Toolbox routines, even nonprogrammers can use AppMaker to design a user interface for an application. The resource editor is familiar and intuitive. Source files also look familiar; they have the same structure as that of Apple's source code examples.

Registered owners of AppMaker for the Macintosh can buy AppMaker/GS at a discount (and vice versa). The package includes a comprehensive manual and free technical support via AppleLink, MCI Mail, facsimile, or telephone. To compile and link the Pascal, C, or assembly language source code that AppMaker/GS generates, you'll also need Apple's MPW Development Environment and the appropriate MPW IIGS cross-development language. There are no licensing fees for applications created using AppMaker/GS.

For ordering information, contact Bowers Development as follows:

Bowers Development
P.O. Box 9
Lincoln Center, MA 01773
(508) 368-8175
AppleLink: D1721
Fax: (508) 369-8224
CompuServe: 70731,3710

Visionary Digitizing System

Visionary GS, from Virtual Realities, allows users to digitize any video signal and import it to the Apple IIGS personal computer. The digitizing hardware is based on the best-selling AST VisionPlus product of 1987, enhanced by Virtual Realities to correct earlier problems. The company has also completely rewritten the accompanying software to support the Apple IIGS System Software Version 5.0 and to provide new features.

The original AST card had these problems: Color modes were susceptible to noise, resulting in grainy and coarse color pictures; the card often caused a system crash when the video signal was lost; and a bright video source resulted in a washed-out picture, most noticeably in black-and-white mode. Virtual Realities, in cooperation with the original designer of the VisionPlus board, has designed several hardware enhancements to eliminate such problems. Pictures in the individual color modes (red, green, blue) are virtually noise free, and the resulting composite picture is superior to the output of the original product.

The Visionary GS package includes the VisionPlus digitizer, which can work in any slot in the Apple IIGS (independent of Control Panel settings), and the

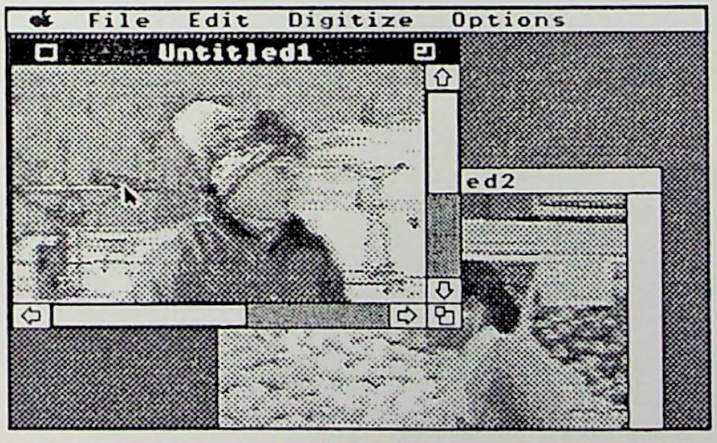


Figure 1

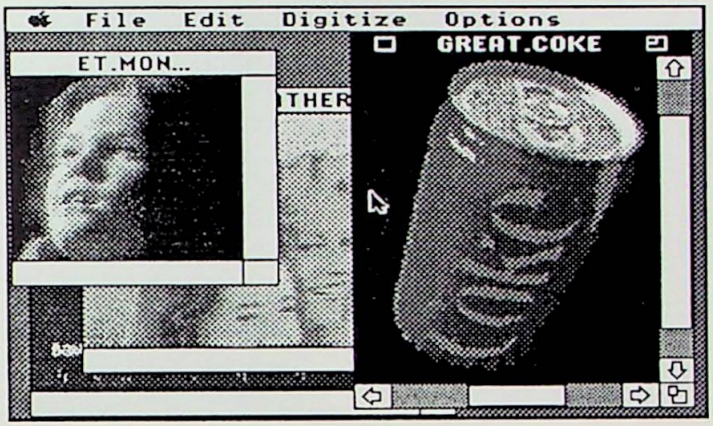


Figure 2

PerfectView digitizing software, which allows you to capture real-time video at 15 frames per second in black and white with up to 16 shades of gray, and color video at 5 frames per second in up to 16 colors.

The PerfectView digitizing software has been completely rewritten to take full advantage of the GS/OS desktop environment. You have the option of live digitizing in full-screen mode or in any window. If you freeze the picture, control returns to the desktop and you can edit the image within the window. You can open up to 64 windows at any one time (memory permitting). The current version of PerfectView operates in 320 mode only and is capable of full-featured black-and-white digitizing, with limited dithering capabilities for color. (See sample screen shots, Figures 1 and 2.)

The Visionary GS product's rate of 15 frames per second in black-and-white mode is accomplished through the use of Direct Memory Access (DMA) data transfer, which allows data to be transferred directly from the digitizing board to the computer's memory with

Figure 3

almost no interaction from the microprocessor. This is the same technique used in the new Apple II High-Speed SCSI Card (with which Visionary GS is compatible). See Figures 3 and 4 for sample output from the Visionary digitizing system.

Installation of the Visionary card is simple because the software is written so that Control Panel settings are not involved in the card's operation. The Visionary card plugs into any slot of the Apple IIGS, including Slot 3; you can use Slot 6, for example, without having to give up the use of your 5.25-inch floppy disk drive(s).

The Visionary GS system requires an Apple IIGS personal computer with a minimum of 1 megabyte of memory and GS/OS Version 5.0 or greater.

Future Enhancements

Future versions of PerfectView, which will be shipped free to registered Visionary card users, will feature advanced color picking and dithering techniques as well as 640 mode support. Users will be able to convert 320 mode gray-scale images to 640 mode with 8 and 16 shades of gray (simulated with dithering), thus allowing export and integration of digitized pictures to AppleWorks® GS and HyperStudio.

An enhancement kit, which will be sold as a separate product when completed, will implement 256 colors per screen, MiniMovies (which captures sections of videotape, frame by frame or all at once), and 3,200-color conversion routines (which allow you to display up to 3,200 colors at once on the IIGS screen). Visionary and ComputerEyes users will be able to manipulate their VID (video image data) and raw-data files to create pictures rendered in 256 colors (standard $c1 multipalette format) and 3,200-color mode (custom format). While multipalette, 256-color pictures can be manipulated with painting programs that support such a feature, 3,200-color

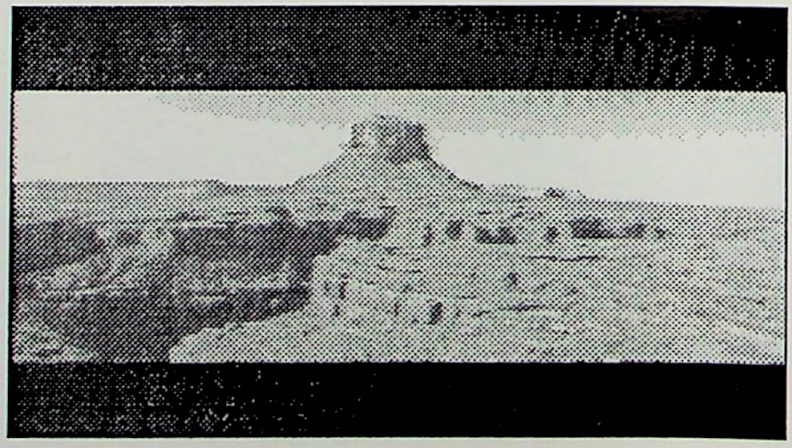


Figure 4

pictures will need a 3,200-color editor/painting program, also planned as a future product.

AST VisionPlus Upgrade Information

Because the Visionary digitizing system is based on the AST product of several years ago, Virtual Realities provides an upgrade to owners of existing VisionPlus boards. The upgrade consists of several modifications made to the user-supplied board, a new version of the software, and a new manual. If you are a VisionPlus owner, you can upgrade to the full Visionary system without sacrificing your original investment in the digitizer board. Call Virtual Realities for more information on the upgrade offer.

Technical Specifications

Hardware

- Video interface: NTSC, RCA phono jack
- Board size: 10.0 in. by 2.75 in.
- Power usage: 0.65 amp typical at 5VDC
- FCC certification: Class B
- Warranty: 5 years, limited
- Black-and-white modes:

Resolution	320 x 200	640 x 200
Shades of gray	16	16
Frames per second	15	5

- Color modes:

Resolution	320 x 200	640 x 200
Colors	16	4 to 16 (with dithering)
Frames per second	5	2

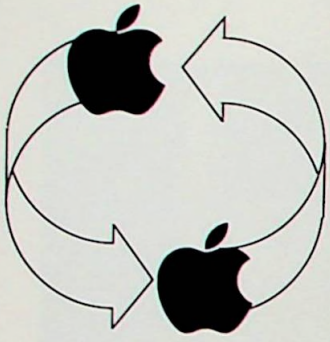
Software

- Video controls: Contrast, brightness, gray levels, color, full-screen/window, wide-screen format
- Image control: Aspect ratio, zoom, horizontal/vertical flip, palette swap and storage
- Color control: Full palette editing, individual color editing, advanced dither modes
- Printer control: Screen data dump, raw color dump
- Printer support: ImageWriter® II printers, Epson printers; GS/OS driver support
- Save format: Apple preferred, screen format, VID
- User controls: Preferences (saved to disk), advanced/standard features
- Operating system: GS/OS Version 5.0.2 or greater
- Software media: 3.5-inch 800K floppy disk

For more information about Visionary GS, contact Virtual Realities as follows:

Virtual Realities, Inc.
1650 Spruce Street, Suite 209
Riverside, CA 92507
(714) 788-0176 or 1-800-729-4605

Comparison of Apple 3.5-Inch Disk Drives



Both the Apple 3.5 Drive and the UniDisk™ drive read and write double-sided, 3.5-inch floppy disks at a formatted capacity of 800K. However, the two disk drives perform differently. Following is a short description of each drive, followed by a table outlining their functional differences.

The UniDisk 3.5 is an intelligent drive; in other words, a microprocessor-based controller inside the drive enclosure communicates with a custom chip in the host computer. This custom chip, the IWM (Integrated Woz Machine), is on the logic board of the Apple IIGS, IIc, and IIc Plus personal computers, and on a controller card in the Apple IIe and II Plus computers. The host sends commands to the intelligent controller in the drive; the controller manipulates the drive hardware to read or write and sends the data back to the host in packet format.

The Apple 3.5 Drive depends on the host computer to manipulate the drive hardware to read data to and write data from the drive.

Feature	**UniDisk 3.5**	**Apple 3.5 Drive**
Compatible with:		
Apple II Plus, IIe	Yes (with UniDisk 3.5 controller card)	No
Apple IIc	Yes (with updated logic board ROMs)	No
Apple IIc Plus, IIGS	Yes	Yes
Macintosh Plus	No	Yes
Macintosh SE, SE/30	No	Yes
Macintosh II, IIx	No	No
Macintosh IIcx, IIci	No	Yes
Macintosh IIfx	No	Yes
Macintosh Portable	No	Yes
Daisy chaining on the Apple IIc Plus	Up to three additional drives; must precede any 5.25-inch drive	Up to three additional drives; must precede any 5.25-inch drive; a UniDisk 3.5 cannot precede an Apple 3.5 Drive

Feature	UniDisk 3.5	Apple 3.5 Drive
Daisy chaining on the Apple IIGS	Up to six drives with ProDOS 16® or GS/OS (up to four with ProDOS 8); drive must precede any 5.25 drive.	Up to six drives with ProDOS 16 or GS/OS (up to four with ProDOS 8); must precede any 5.25 drive; UniDisk 3.5 cannot precede an Apple 3.5 Drive
Copy protection and the IIc Plus	ROMs on the IIc Plus do not provide support for copy-protection schemes; some programs will not work correctly.	
Startup and the IIc (with latest ROMs)	Start up with PR#5 instead of #7	Can't be a startup drive
GS/OS compatibility	Since the drive can't tell GS/OS that a floppy disk is present, the drive must be polled, causing the in-use light to flash.	Provides information to GS/OS without polling
Case color	White	Platinum

Farallon Computing: About Network Termination

Thanks to Farallon Computing for permission to reprint the following information from its publication Tech Notes.

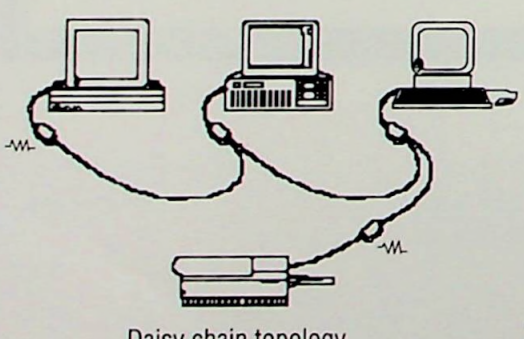
Termination affects the topologies of PhoneNET, LocalTalk® networks, and compatible networks—the more flexible the termination, the more flexible the network. One of the primary advantages that the PhoneNET Connector brought to the networking world was to increase the kinds of topologies, or cabling layouts, in which LocalTalk cabling could be used. Farallon expanded the possible topology from daisy chain to backbone, star, and mixed topologies, while tripling the maximum network length.

The key to expanding the range of network topologies was moving the terminating resistor out of the connector. For purposes of simplicity, the original LocalTalk connector was designed with one cable, one connector, and one topology. A terminating resistor, which is physically disengaged by inserting a cable into the jack, is built into each socket. If only one socket is used on the connector, the terminator on the other socket remains engaged. When there is a connector with only one jack used, the network is terminated only at the endpoints of the network, a scheme that is simple and works well, but limits the choice of topologies to daisy chain.

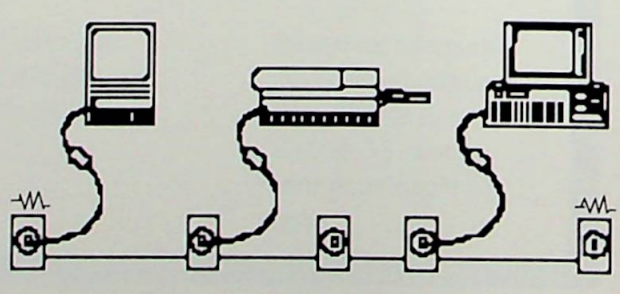
By removing the terminator from the connector, Farallon was able to expand the types of topologies available to the user, allowing star, backbone, and mixed-type networks. Network reliability is established by following Farallon wiring guidelines and termination options, which retain the flexibility of a wide variety of topology options.

In the following diagrams, the symbol

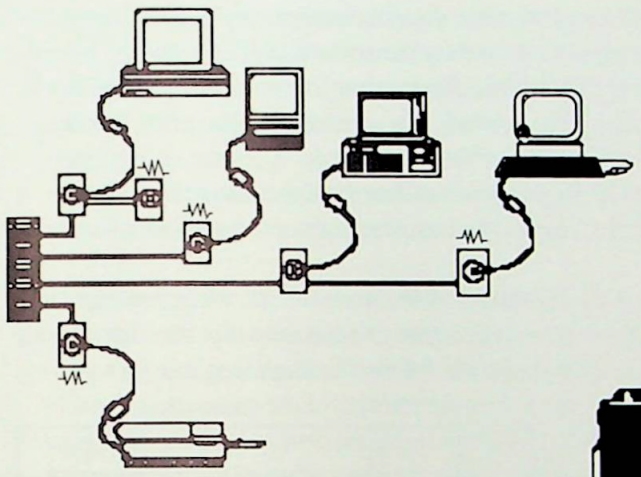
denotes the proper location for a terminating resistor on the network.



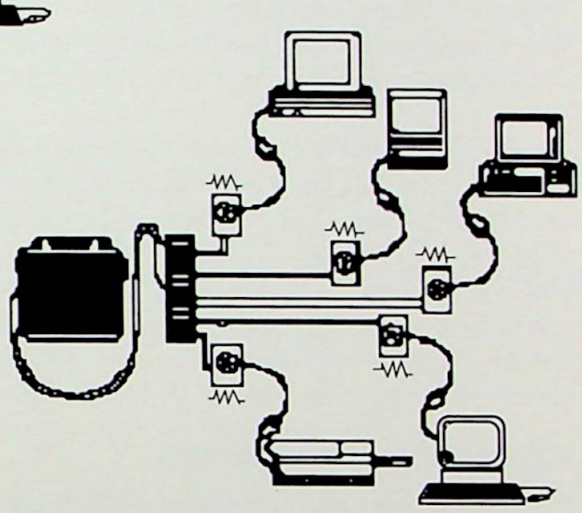
Daisy chain topology



Backbone topology



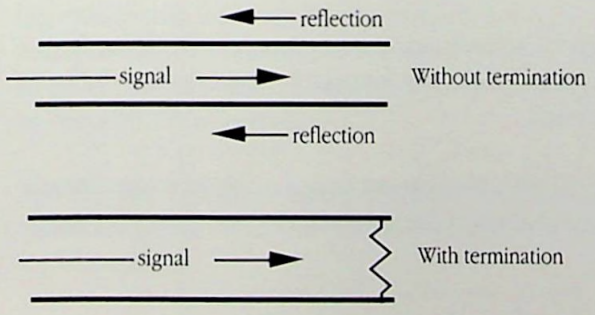
Passive star topology



Active star topology

Why Is Termination Required?

Devices on an AppleTalk® network exchange information by transmitting sequences of electrical signals through the network cabling. When a signal reaches the end of a length of cable, it can be either absorbed or reflected. A reflected signal can cause errors that make a network appear to be slow, or cause network devices to occasionally disappear from the network.



Terminating a network reduces reflections

A resistor of the correct value placed at the end of a length of cable absorbs the signal and reduce reflections, allowing the signal to travel on the cable at full strength, while limiting the amount of noise (reflections) on the network. Typically, telephone wire offers 100 to 120 ohms of characteristic impedance. A change in the impedance of the wire causes a signal to reflect back on the network. An unterminated line offers infinite resistance to a signal, causing the entire signal to be reflected back to the network. A resistor of improper value causes some of the signal to be reflected. A 120-ohm resistor matches the impedance of the wire, in effect adding an infinite length of wire and causing the signal to be completely absorbed without reflections.

The objective of good network design is to maintain the highest possible signal strength while limiting reflections and other types of noise that enter the network. A high signal-to-noise ratio is particularly important in longer networks, where signal strength is diminished because it travels through long runs of wire. Placing too many resistors, of any value, on a network may reduce the strength of the transmitted signal by absorbing it in many places. The reduced signal makes it difficult for receiving devices far from the transmitting machine to clearly differentiate the signal from the background noise, thus reducing the maximum cabling distance of the network. Long networks are also more susceptible to problems with reflections, because the timing of the "echoed" signal is more likely to conflict with the transmitted signal on the network.

Network Wiring and Termination Guidelines

Farallon has done considerable research in the area of network topologies. The PhoneNET Connector permits you to run AppleTalk over ordinary phone cable and add a computer to the network as easily as you plug a phone into a wall jack. It's easy to use, but requires careful planning. Make the effort to install your network correctly now and you will be rewarded by trouble-free performance over the long term. The research done by Farallon has resulted in the PhoneNET System and the wiring and termination guidelines found in the *PhoneNET Connector User's Guide* and summarized below.

Wiring Guidelines for PhoneNET System Cabling

This section provides guidelines that produce reliable networks under most circumstances. Deviating from the guidelines may sometimes produce properly operating networks, but for reliable networks that can be safely expanded in the future, follow these guidelines closely.

- Each branch of a star is treated as a separate length of cable. You cannot borrow cable from one branch of a star to exceed the recommended limits on another branch of the same star.

- When wiring backbone and star networks, always install wall jacks or line taps as close as possible to each device location. Use the shortest possible modular extension cable between the device and the wall jack or line tap. The length of any one piece of modular extension cable connected to a backbone or star should not exceed 50 feet.

- For every foot of modular extension cable attached to a backbone or branch of a star, diminish the recommended maximum lengths given in the tables by 4 feet.

The tables below list the recommended maximum length of cabling and number of devices for various wire gauges and network topologies, for networks operating at normal LocalTalk speeds (230.4 kbps) and at higher speeds, such as those used by FlashTalk (768 kbps).

Topology (230.4 kbps)	22 gauge	24 gauge	26 gauge	Max # nodes
daisy chain	n/a	n/a	1,800 ft	24
backbone	4,500 ft	3,000 ft	1,800 ft	48
3-branch passive star (each branch)	1,500 ft	1,000 ft	600 ft	16
4-branch passive star (each branch)	1,125 ft	750 ft	450 ft	12

Guidelines for LocalTalk speeds (230.4 kbps)

Topology (768 kbps)	22 gauge	24 gauge	26 gauge	Max # nodes
daisy chain	n/a	n/a	600 ft	18
backbone	1,500 ft	1,000 ft	600 ft	36
3-branch passive star (each branch)	500 ft	333 ft	200 ft	12
4-branch passive star (each branch)	375 ft	250 ft	150 ft	9

Guidelines for higher speeds (768 kbps)

How to Terminate a Network Segment Using PhoneNET System Cabling

Terminate a network segment by installing 120-ohm terminating resistors at select locations on the network segment. Each PhoneNET Connector includes two easily installed 120-ohm terminating resistors. A terminating resistor with leads can be mounted in a wall jack. An RJ11-mounted terminating resistor can be plugged into a PhoneNET Connector or wall jack. Networks should have no more than four resistors installed on any single continuous network segment without using an active repeating device such as the PhoneNET Repeater or PhoneNET StarController.

The best place for the twisted-pair cable to be terminated is where the wires end—in the wall jack. The connector used to attach the computer to the network wiring is a less desirable place to terminate the network for two reasons:

- The connectors are made with modular jacks; they are easy to install and easy to remove. You may decide to move the computer, or might need to add a connector in a daisy chain. If you have terminated in the

wall jack, the network will still be properly terminated. If you terminated in the connector, however, the network may be subject to harmful reflections when the terminating resistor is removed.

- You should set up the network so that when you add more machines, you'll be able to simply plug them into the wall. For the time being, those "spare" wall jacks will have no connector attached. Only by terminating in the wall jacks can you be sure that the wiring is terminated at the ends of all branches.

The following table tells you where you need to install terminating resistors for network segments using PhoneNET System cabling.

PhoneNET Topology	Instructions for Terminating the Network Segment
daisy chain	Install an RJ11-mounted terminating resistor in the PhoneNET Connector at each end of the daisy chain.
backbone	Install a terminating resistor inside the wall box at each end of the backbone.
passive and active star	Install a terminating resistor inside the wall box at the end of each network branch.

"Self-Terminating" Connectors

In an environment where flexible configurations are necessary, termination is an important consideration. Products that claim to be "self-terminating" have two LEDs (light-emitting diodes) back to back in series, with two 120-ohm resistors. When the signal coming through the connector rises above a preset level (about 1.5 volts), the LEDs pass the signal through (giving off light) and the network "sees" the two resistors. The effect is that the connector looks as though it is terminated with a 330-ohm resistor if the signal is greater than 1.5 volts; at lower signal strengths it looks like an unterminated connector. Such a mechanism cannot guarantee adequate termination for the following reasons:

- 330 ohms does not match the impedance of the network cable closely enough to prevent harmful reflections. It doesn't reflect the signal completely, as an unterminated cable does, but it does cause considerable reflection of the signal.

- Signals of all strengths must be terminated, not just those greater than 1.5 volts. Reflections of low-level signals that have traveled through a lot of cable are just as harmful as high-level signals. The reflections raise the amount of low-level background noise on the network, making it impossible for an AppleTalk device to distinguish signals transmitted across a lot of cable from noise on the network. Some small networks will work without termination because the timing of the reflection doesn't interfere with the intended signals. However, the problem of reflections is most critical in long networks, which is precisely where "self-terminating" connectors are least effective.

- Terminating the network wherever the signal exceeds 1.5 volts causes the network to be more heavily loaded. It will tend to limit, or "clamp," the network signals to 1.5 volts instead of the 5 volts that are transmitted by most AppleTalk devices. As more "self-terminating" nodes are added to the network, signal strength is decreased relative to noise on the network, making it more difficult for the AppleTalk device to distinguish the good information from the background noise. Since long runs of cable also diminish signal strength, the extra loading from such connectors effectively reduces the maximum size of the network. The effect is similar to driving all day with your emergency brake on in order to avoid an accident.

In short networks that have few nodes, "self-terminating" connectors can be used without obvious network problems. In fact, many small PhoneNET networks have been built without any termination at all and work very well. However, as the network grows in length and in number of attached nodes, proper termination is key to long-term network reliability.

Apple II Setup and GS/OS: Compatible Versions

To start up an Apple IIGS computer on a network, you must run the GS/OS Installer from an Apple IIGS logged on to the server. You then install the desired GS/OS configuration on the server volume. If a version of the ProDOS 16 operating system is on the server, you may not be able to find the GS/OS files, resulting in a "file not found" error ($0046).

For example, if you use AppleShare File Server Apple II Setup Version 2.1.1—a release specifically for GS/OS Version 5.0.2—while ProDOS 16 (System Disk 3.2 or earlier) is used on the server, the mismatched versions will cause such problems. Apple II Setup Version 2.0.1 was designed to work with ProDOS 16, the predecessor to GS/OS; Version 2.0.1 files are quite different from Version 2.1.1 files.

Always use Version 2.1.1 of the Apple II Setup Installer with a server that has GS/OS Version 5.0.2 installed. Use Version 2.0.1 of the Apple II Setup Installer on servers that use the earlier ProDOS 16 system files, which are found on System Disk 3.2 and earlier.

Note that Apple II Setup Version 2.1 was designed for use only with GS/OS Version 5.0. The correct combination to use is GS/OS Version 5.0.2 and Apple II Setup Version 2.1.1, which is distributed with the Apple IIGS system software (A0013LL/A).

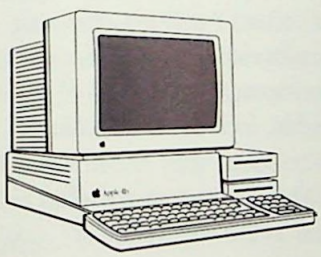
Apple II Systems: How to Identify Them With Inter•Poll

The Inter•Poll® Network Administrators Utility can identify an Apple IIe or Apple IIGS computer connected to a network only when the following criteria are met:

- On Apple IIGS computers with older logic boards (those with 256K of RAM) in the Control Panel, set Slot 7 to "Built-in AppleTalk," and Slot 1 to "Your Card."
- On Apple IIGS computers with newer logic boards (those with 1MB of RAM) in the Control Panel, set Slot 7 to "AppleTalk," and Slot 1 or Slot 2 to "AppleTalk."
- An Apple IIe with the Apple II Workstation Card must have passed the Password screen.

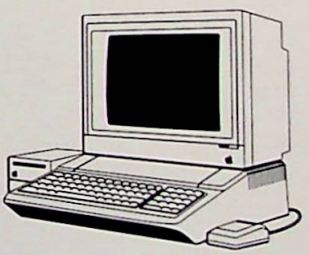
Apple IIGS

To be able to see an Apple IIGS in the Inter•Poll Device List window, follow these steps:



1. For 256K boards, select Built-in AppleTalk in the Control Panel of the Apple IIGS. For 1MB boards, select AppleTalk for Slot 7.
2. Also in the IIGS Control Panel, set the port that the network is connected to—usually the Printer port—to "Your Card" for 256K boards, and to "AppleTalk" for 1MB boards.
3. Shut down and restart the system.
4. Run Inter•Poll on the Macintosh. The Apple IIGS will show up in the Device List window.

Apple IIe



To be able to see an Apple IIe in the Inter•Poll Device List window, follow these steps:

1. Install the Apple II Workstation Card in Slot 7 of the Apple IIe, and connect the LocalTalk port to the network.
2. Start up the Apple IIe and log on to a ProDOS server on the network.

When the IIe system passes the Password screen, the computer shows up in the Inter•Poll Device List window.

Similarly, if a Macintosh computer is powered up, but no software is loaded (that is, the Macintosh screen shows the disk with a flashing question mark), Inter•Poll cannot identify the system; there is no AppleTalk software to respond to the Inter•Poll request.

PhoneNET StarController and Apple IIGS Fix Available

Thanks to Farallon Computing for the following information.

In networks that include Apple IIGS computers, network activities may slow down when a PhoneNET StarController is involved in transmitting Apple IIGS data packets. Because of differences in the implementation of LocalTalk on the Macintosh and the Apple IIGS, a substantial percentage of Apple IIGS packets can be lost, requiring retransmission and causing sluggishness on the network.

The Solution

Farallon engineers have revised the StarController PAL (Programmable Array Logic) chip, allowing the StarController to function properly in a network that contains Apple IIGS systems. The revised chip is necessary only for customers who are using the StarController with the Apple IIGS. The new PAL allows mixed networks of Macintosh and Apple IIGS computers, but does not increase performance in networks that don't include Apple IIGS systems.

If you have an active StarController (Series 200) network with Apple IIGS systems, contact Farallon Computing Technical Support, and they will make sure that you have a properly functioning network. The phone number is (415) 596-9000; the AppleLink address is TECHSPORTS. If you are considering installing a StarController network in the near future, the Series 300 StarController, now available, includes the solution.

Farallon regrets any inconvenience you may have been caused by this problem. Note that it does not affect the PhoneNET Repeater, which can be used to connect two network segments, just as the StarController connects 12 segments.

AppleShare: How to Check for ProDOS Files

In the setup of an AppleShare file server for an Apple IIe and Apple IIGS environment, two copies of ProDOS 8 are installed. One copy is installed when the server is updated with the Apple II Setup Disk (a Macintosh disk) for the AppleShare file server; this copy is placed in the Server Folder. Another copy is installed when GS/OS is loaded from an Apple IIGS using the GS/OS SYSTEM.DISK and SYSTEM.TOOLS (Apple IIGS disks); this copy is placed in the GS/OS System Folder on the server.

To ensure consistent application compatibility, it's important that you use the current Apple II Setup Disk to install both copies of ProDOS 8. Use the Apple II Setup Disk marked "Version 2.1.1; for use with Apple IIGS System Software 5.0.2."

To check that ProDOS 8 (labeled "P8") is properly installed, you must start up the server from a floppy disk and then perform the check; you'll be able to see both copies of ProDOS 8 in their appropriate locations. To check the version number, choose Get Info from the File menu.

If you perform your check from an Apple IIGS workstation, the Server Folder is not visible; you will find only the ProDOS file in the GS/OS System Folder.

If you perform your check from a Macintosh on the network, the result will be the same as when checking from an Apple IIGS workstation; there is no Server Folder available.

If you perform your check on the server from within the Admin application, you will see the Server Folder, but you cannot open that folder and review its contents.

Creating Footnotes in AppleWorks 3.0

Thanks to inCider *magazine for allowing us to reprint this information from the March 1990 issue.*

Although AppleWorks 3.0 makes no provision for footnotes at the bottom of the page, you can create footnotes by following these steps:

1. Using the instructions below, type a superscript asterisk at the end of the word that requires a footnote.

   —Press Command-O (Open Apple-O) to bring up the Options menu.
   —Type +B (Superscript Begin), press Return, and then press Escape.
   —Type an asterisk (Shift-8).
   —Press Command-O to get the Options menu.
   —Type +E (Superscript End), press Return, and then press Escape.

2. To find the bottom of the page where you want your footnote to appear, press Command-K, and select the printer you want to use. Then scroll down to the end of the page on which you put the asterisk.

3. To create a solid line that separates the text from the footnote, press Control-L (underline). Use the space bar to move the cursor across the page, and press Return to end the underline.

4. Type your footnote, with a superscript asterisk at the beginning (see instructions in step 1).

5. Because you've changed the text and pagination, repeat the Command-K procedure in Step 2. The footnote displays as a headnote at the top of the next page, which lets you know the number of lines you need for the footnote.

6. With the cursor at the beginning of the underline, press Command-M to move the text, and choose Within Document for the entire footnote.

7. From the original end-of-page line, position the cursor back the number of lines you need for your footnote, and press Return.

8. Repeat the Command-K procedure in Step 2 to make sure that the entire footnote is at the bottom of the page.

9. Check to see that the text that should follow the footnoted page begins on the next page instead of at the end of the footnote.

You might need to try more than once to place the text correctly, especially if you need more than one footnote on a page.

Apple IIGS: Displaying in Monochrome Mode

When you run some Apple II software applications in color on the Apple IIGS, they may not display clearly. Depending on the monitor you're using—the AppleColor™ Composite Monitor (A2M6020) or the AppleColor RGB Monitor (A2M6014)—you may be able to improve the image clarity.

AppleColor Composite Monitor

If you're using the composite monitor, the following two steps may improve the displayed image:

- The first step involves a switch behind the front access door on the lower portion of the monitor. One switch setting provides a color display; the other provides a monochrome display (green pixels on a black background). If you set the switch to the monochrome mode, the image should improve.

- The second step involves the setting in the Apple IIGS Control Panel display device that allows you to select monochrome or color mode; select the monochrome mode.

If you use both the switch on the monitor and the setting in the Control Panel, some Apple II software applications may have a cleaner appearance.

AppleColor RGB Monitor

With the RGB monitor, you may not be able to improve the images, because the clarity is related to which pixels are turned on by the application. In color, some pixels bleed into other pixels' area of the screen, causing a blurred image. The only solution is for the programmer to rewrite the program to compensate for the problem.

Current Apple II Operating Software and Product Upgrades

Thanks to the AppleGram™ staff for developing the following charts, which contain information about:
—The version of operating system software recommended for each of Apple's hardware products
—Current upgrade options available from Apple

For additional information about upgrades and updates, see page 29.

Apple II Operating System Software

	Current Version	Date Released
ProDOS 8	3.1	4/2/88
System Disk (Apple IIe, Apple IIc)		
GS/OS 5.0.2	5.0.2	7/15/89
System Disk (Apple IIGS)		
System Tools Disk (Apple IIGS)		

Apple II Displays

	Apple IIe	Apple IIc Plus	Apple IIGS
Apple Monochrome Monitor IIe	•		
AppleColor Composite Monitor IIe	•		
Apple Monochrome Monitor		•	•
AppleColor Composite Monitor		•	•
AppleColor RGB Monitor			•
Apple II Monitor Stand		•	•

Miscellaneous Peripheral Operating Software

AppleCD SC®	• Apple II CD Setup Version 3.0.1 • Apple IIGS CD Setup Version 1.1

Networking & Communications Software

Access II	• Version 1.1.3
AppleShare	• AppleShare Print Server Version 2.0 • AppleShare File Server Version 2.0.1 • Apple II Setup Disk Version 2.1.1
Apple File Exchange	• Version 1.1.4
Aristotle™	• Version 1.0

Apple II Upgrades

	Apple IIc	Apple IIc Plus	Apple IIe (unenhanced)	Apple IIe (enhanced)	Apple IIGS	
Apple II 256K Memory Expansion Kit	•		•[1]	•[1]	•[1]	**Memory Expansion**
Apple IIe Memory Expansion Card			•	•		
Apple IIGS Memory Expansion Card					•	
Apple IIe Enhancement Kit			•			**Logic Board Upgrades**
Apple IIGS Enhancement Kit			•	•		
Apple 5.25-inch Floppy Disk Drive	•	•	•	•	•	**Drives**
Apple 3.5-inch Floppy Disk Drive		•			•	
UniDisk 3.5-inch Floppy Disk Drive	•	•	•	•	•	
Apple External 20SC Hard Disk				•	•	
Apple External 40SC Hard Disk				•	•	
Apple External 80SC Hard Disk				•	•	
Apple External 160SC Hard Disk				•	•	
AppleCD SC (CD-ROM Drive)				•	•	
Apple II High-Speed SCSI Card				•	•	**Cards**
Super Serial Card			•	•	•	
AppleTalk Workstation Card			•	•		
Extended 80-Column Text Card			•	•		
Apple II Video Overlay Card				•	•	
Apple Modem (1200 bps)	•	•	•	•	•	**Modems**
Apple Modem (2400 bps)	•	•	•	•	•	

Printer Upgrades

	ImageWriter II	ImageWriter LQ	LaserWriter	LaserWriter Plus	LaserWriter IIsc	LaserWriter IINT	LaserWriter IINTX
ImageWriter 32K Memory Option (Apple II only)	•	•					
LaserWriter® IINTX 1MB Mem. Exp. Kit							•
LaserWriter IINTX 4MB Mem. Exp. Kit							•
LaserWriter Plus Kit (ROM Upgrade for LaserWriter)			•				
LaserWriter Plus Kit (ROM Upgrade for LaserWriter Plus)				•			
LaserWriter IINT Controller Card					•		
LaserWriter IINTX Controller Card					•	•	

Memory Expansion

Logic Board Upgrades

Many hardware upgrades have configuration prerequisites, and require installation by an authorized Apple service provider.

For complete information regarding any Apple upgrades or updates, contact your authorized Apple reseller or an Apple sales representative. For the location of the reseller nearest you, call 1-800- 538-9696.

Printer Software

LaserWriter	• IIGS LaserWriter Driver 3.0
LaserWriter Plus	• IIGS LaserWriter Driver 3.0
ImageWriter	• ImageWriter 2.7 (for direct-connect printers)
ImageWriter II	• AppleTalk Apple IIGS ImageWriter 3.0 (for AppleTalk-connected printers) • Apple IIGS ImageWriter 3.0 (for direct-connect printers)
ImageWriter LQ	• LQ AppleTalk ImageWriter 2.0 (for AppleTalk-connected printers) • LQ ImageWriter 2.0 (for direct-connect printers)

Current Apple Upgrades and Updates

An **upgrade** enhances features of existing hardware or software. Generally, an upgrade involves a fee, and any additional Apple hardware must be installed by an authorized Apple service provider.

A software **update** consists of enhancements, fixes, or patches to software. An update to Apple software is handled through an authorized Apple dealer or your Apple sales representative.

Following is a summary of the Apple upgrades and updates currently available for Apple II products.

Apple II High-Speed SCSI Card

This card replaces the existing Apple II SCSI Card. Order number A0220LL/A.

Apple IIe to Apple IIGS Upgrade

Your authorized Apple service provider can install a new logic board to upgrade the Apple IIe to an Apple IIGS.

Apple IIe to Enhanced IIe Upgrade (Apple IIe Enhancement Kit)

Your authorized Apple service provider can install the chips required to enhance the Apple IIe.

AppleWorks

For information about upgrades for AppleWorks, please contact:

Claris Corporation
P.O. Box 526
Santa Clara, CA 95052
1-800-544-8554

Apple IIGS System Software Version 5.0.2

Apple IIGS System Software Version 5.0.2 corrects several problems discovered in the recently released System Software Version 5.0. The changes affect these disks: System.Disk, System.Tools, and AppleShare File Server Apple II Setup Disk.

All customers who purchased System Software Version 5.0 are entitled to a free upgrade to Version 5.0.2. Coupons for the software update are available from your Apple dealer or sales representative. An electronic version of the coupon is posted on the AppleLink network under the Apple Programs icon in the Upgrade and Update Programs folder.

The Apple IIGS System Software is available as a stand-alone product (order number A0013LL/A) and as part of an Apple IIGS CPU product (order number A0012LL/A).

Apple II Technical Bulletin

Managing Editor: Armi Costello
Technical Editor: Shelley Bowers
Writer: Jennifer Woodul
Editor: Teri Thomas
Copy Editor: Van Goode
Production Manager: Susan Moore
Contributor: Tim Swihart

Special thanks to Apple's Technical Communication group and Technical Information Services group for their written contributions and technical expertise.

If you have any comments or suggestions, please contact:

Technical Bulletins
Apple Computer, Inc.
900 East Hamilton Avenue, M/S 72L
Campbell, CA 95008
AppleLink: TECHBULLETIN

The Apple II Technical Bulletin provides users with current technical information about Apple products. Featured topics may be under consideration, and new product versions may be under development. Therefore, it's appropriate to consider this publication as a bulletin that is correct at the date of publication, rather than as a long-term reference source.

Technical Bulletin Subscriptions

Apple Technical Bulletins are bimonthly publications designed to provide timely and useful technical information to Apple II and Macintosh users, particularly those who provide technical support to other users. Articles about new products, compatibility and connectivity issues, "power user" features, and product updates and upgrades help you use your Apple hardware and software more effectively and efficiently. Two editions are available, for an annual subscription price of $129 each: the Apple II Technical Bulletin (order number B0134LL/A) and the Macintosh Technical Bulletin (order number B0133LL/A). Each edition is published six times a year. Subscribers also receive the full text of each issue on disk. A storage binder is included.

Apple Technical Bulletins are also available as part of the Apple Software Update Program. For more information, contact your authorized Apple reseller or Apple sales representative.

Apple Computer, Inc.
20525 Mariani Avenue
Cupertino, California 95014
(408) 996-1010
TLX 171-576